

# Aesthetic Thresholds and Their Development for Pests of Ornamental Crops

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# Decision Making Models

- AIL - Aesthetic Injury Level  
(protects appearance)
- EIL - Economic Injury Level  
(protects investment)
- Hybrid EIL – Protects aesthetics driven economic value of investment

# Establishing AILs

- **Expert Estimation**
  - Best guess
  - Study of injury density relationships
- **Surveys**
  - Market surveys (actual retail sales)
  - Contingency valuation
  - Records of treatment requests

# Economic Injury Model (Pedigo et al. 1986)

$$EIL = \frac{C}{VIDK}$$

C= cost of control (\$)

V= value of crop

I= injury /pest density

D= \$ lost/unit injury

K= efficacy of control

# Economic Injury Model (Pedigo et al 1986)

$$EIL = \frac{C}{VIDK}$$

VIDK

C= cost of control (\$)

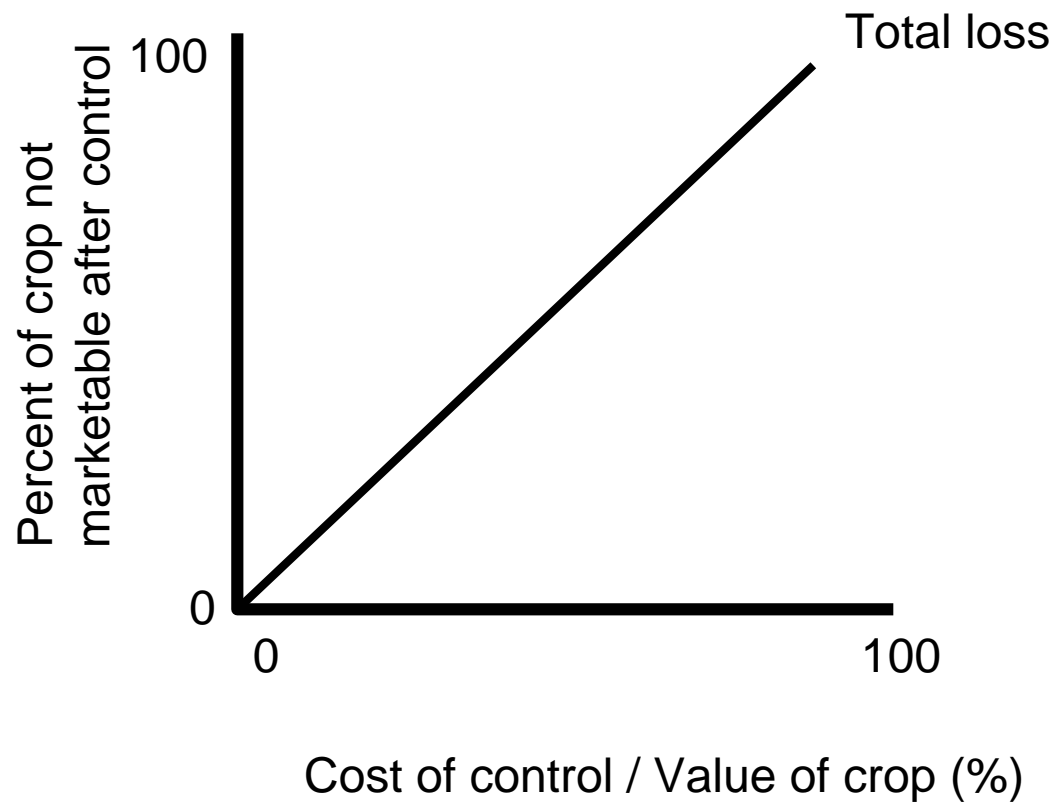
V= value of crop

I= injury /pest density

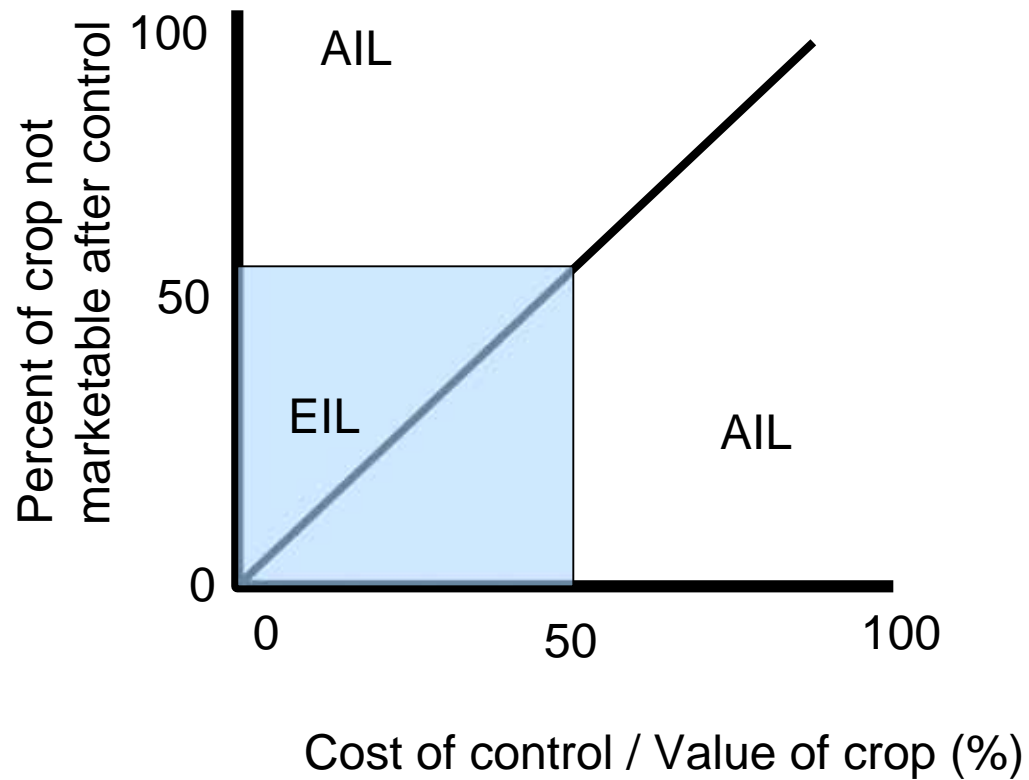
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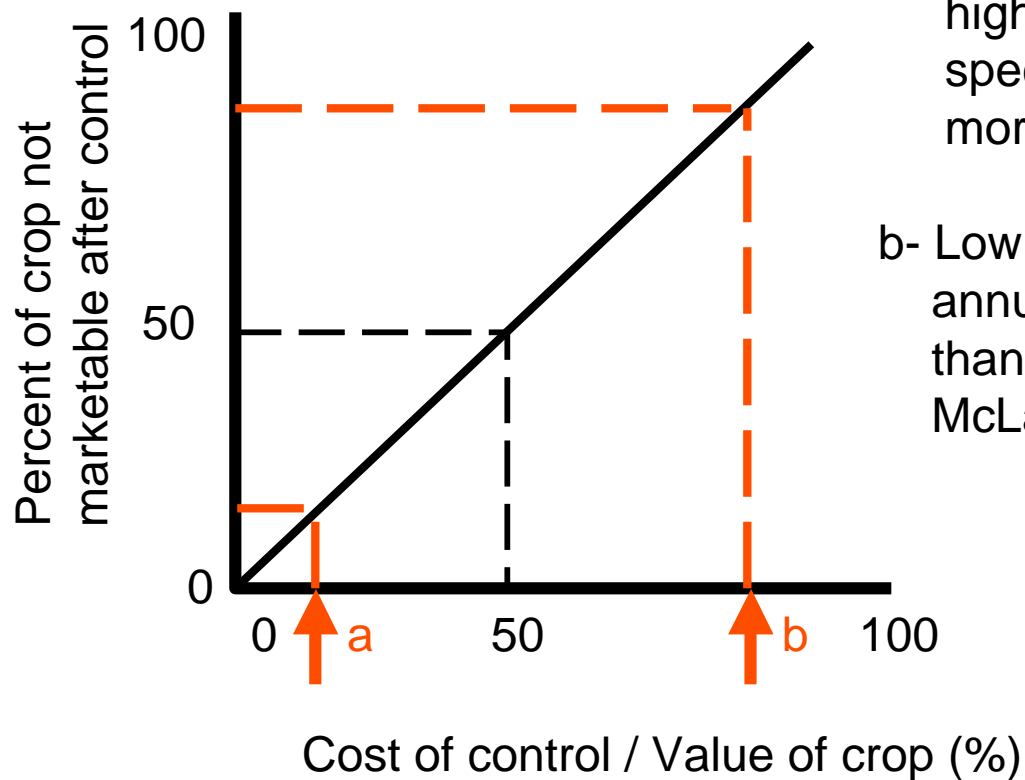
# Using C/V ratio to make decisions



# C/V Ratio and EIL Utility



# C/V Ratio of Ornamental Systems



- a- Production systems  
high value landscape plants  
specimen trees are managed  
more than replaced
- b- Low value landscapes  
annual beds are replaced more  
than managed  
McLandscapes



# Estimating Injury

$$EIL = \frac{C}{VIDK}$$

V I D K

C= cost of control (\$)

V= value of crop

I= injury /pest density

D= \$ lost/unit injury

K= efficacy of control

# Correlate insect density with objective measure of discolor

## Leaf Discolor Rating Scheme



**index**

**1**

**2**

**3**

**4**

**5**

**6**

**% discolor**

**0**

**2.56**

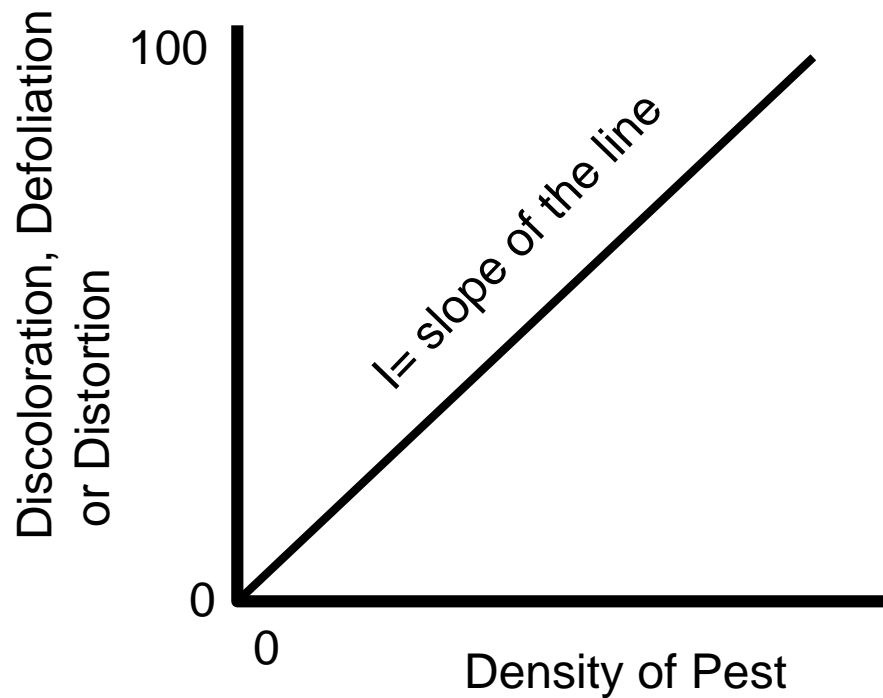
**5.32**

**10.66**

**22.80**

**50.167**

# Estimating Insect Injury Caused by a Known Pest Density



# Estimating Efficacy of Control

$$EIL = \frac{C}{VIDK}$$

**K**

C= cost of control (\$)

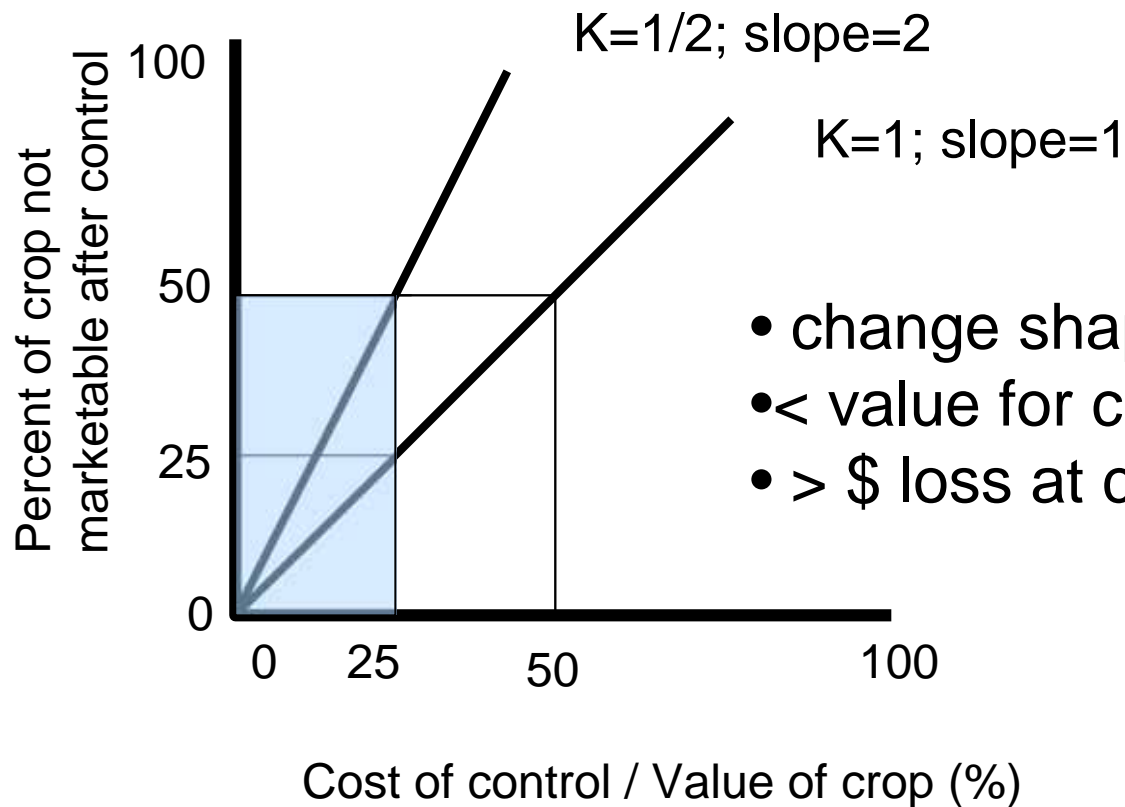
V= value of crop

I= injury /pest density

D= \$ lost/unit injury

**K= efficacy of control**

# Effect of $K < 1$ on Decisions Driven by Cost/Value Ratios



- change shape of EIL zone
- $<$  value for control action
- $>$  \$ loss at c/v ratio

# Effects of K on Applicability of Control Tactic

- Fits decisions about spray or augmentation BC tactic???
- Fits Conservation Biological Control ???
  - Assign costs for BC
  - Assign
- Fits Sustainable Landscape Design???

# Estimating Damage

$$EIL = \frac{C}{VIDK}$$

VIDK

C= cost of control (\$)

V= value of crop

I= injury /pest density

D= \$ lost/unit injury

K= efficacy of control

# Estimating Damage

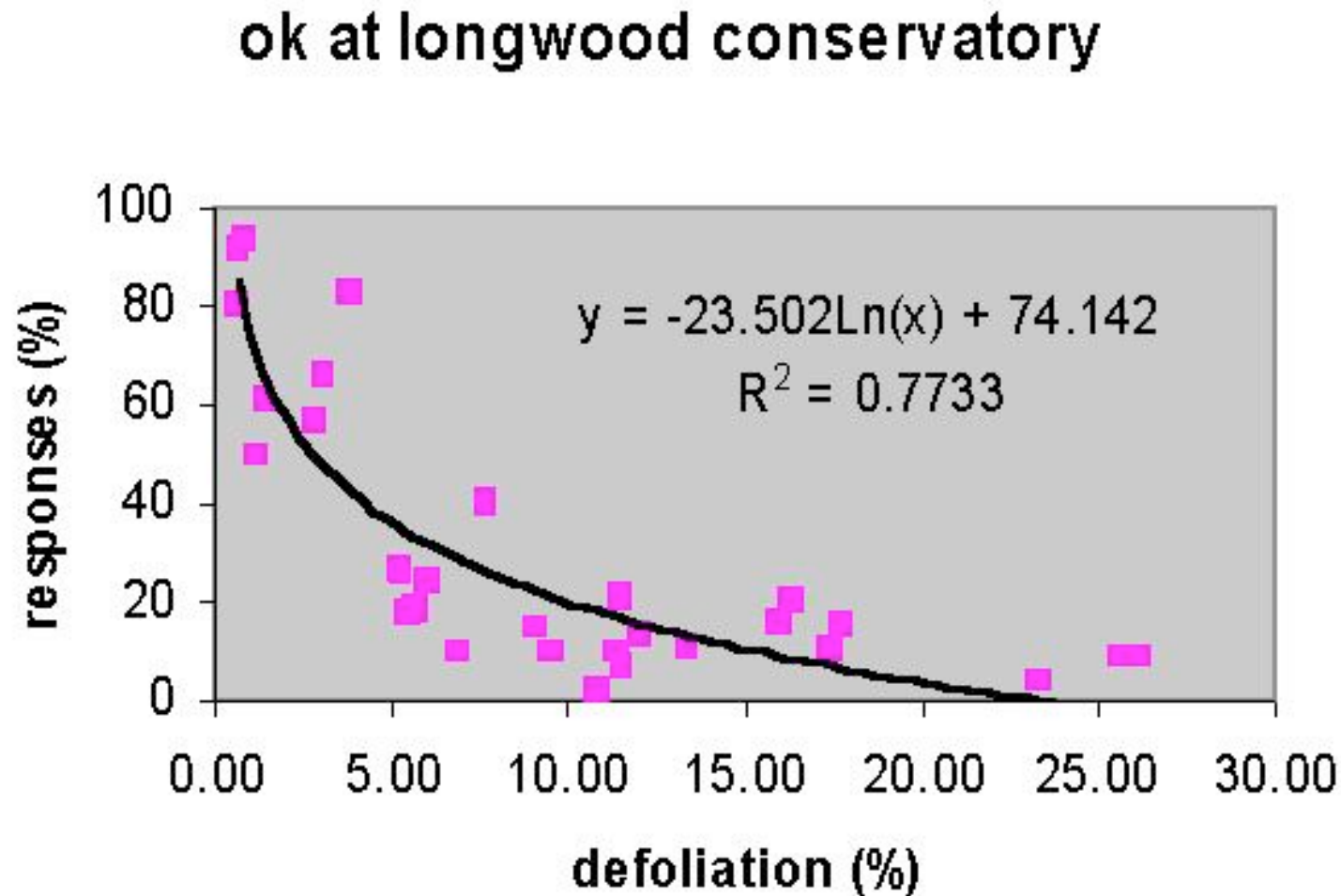
- Determine relationship between injury and marketability using the contingency valuation technique



# How much injury is acceptable?



# Acceptability of Cannas with Japanese Beetle Defoliation (n=587)



# Generalities

- Response is bimodal – Acceptance is >50% until threshold of injury is reached
- Thresholds consistently < 10% distortion, discoloration, defoliation among a number of cropping systems:

Bagworm, Japanese beetle, Two spotted spider mite, Western flower thrips



# - Can Low Tolerance be Changed?







# Potential Factors Affecting Tolerance to Defoliation

- Visual context (Plant Location)
- Presence of flowers
- Quality of best plant available (BPA)
- Presence of flowers \* Quality of BPA
- Economic Stake







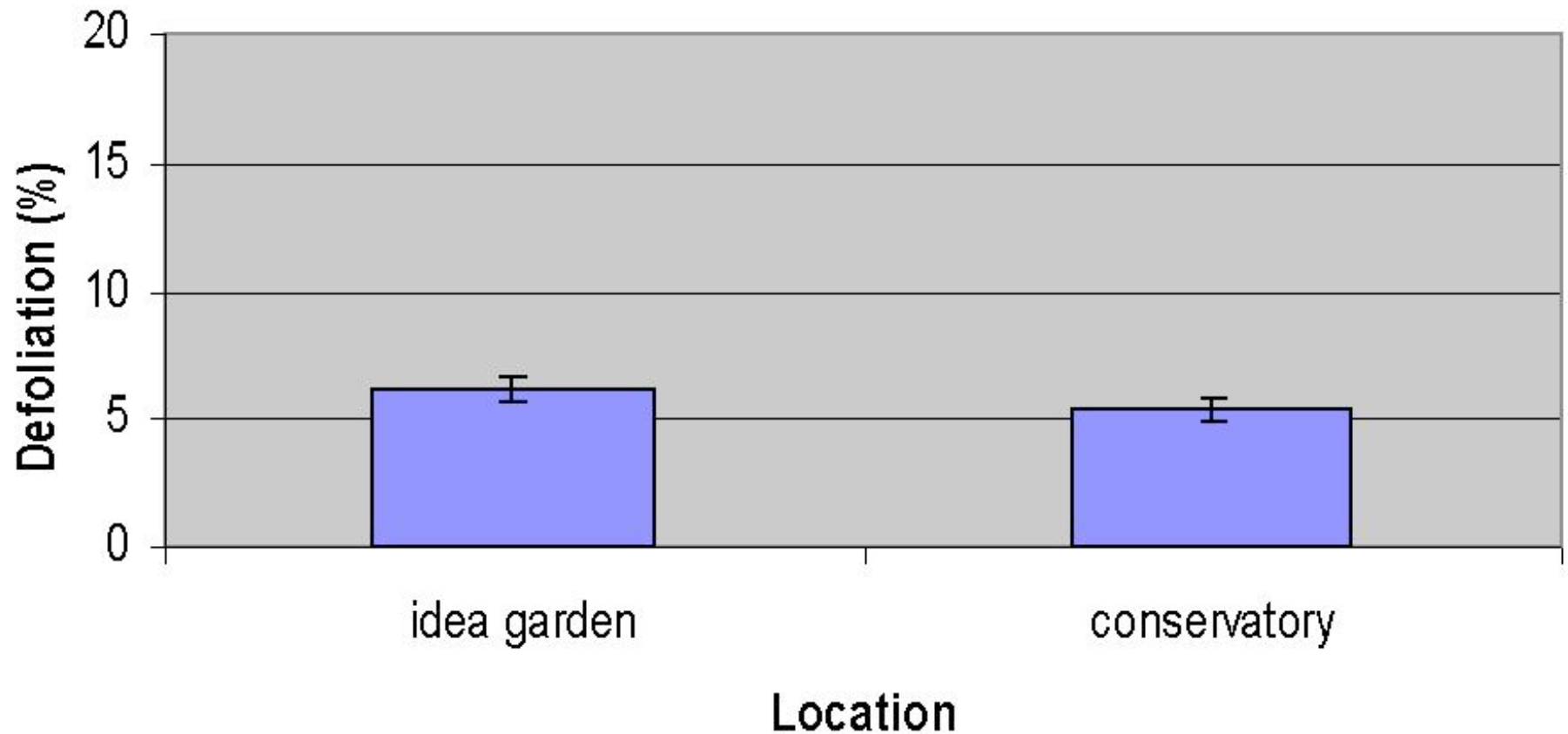




# Canna Defoliation Study

## Effects of Plant Location

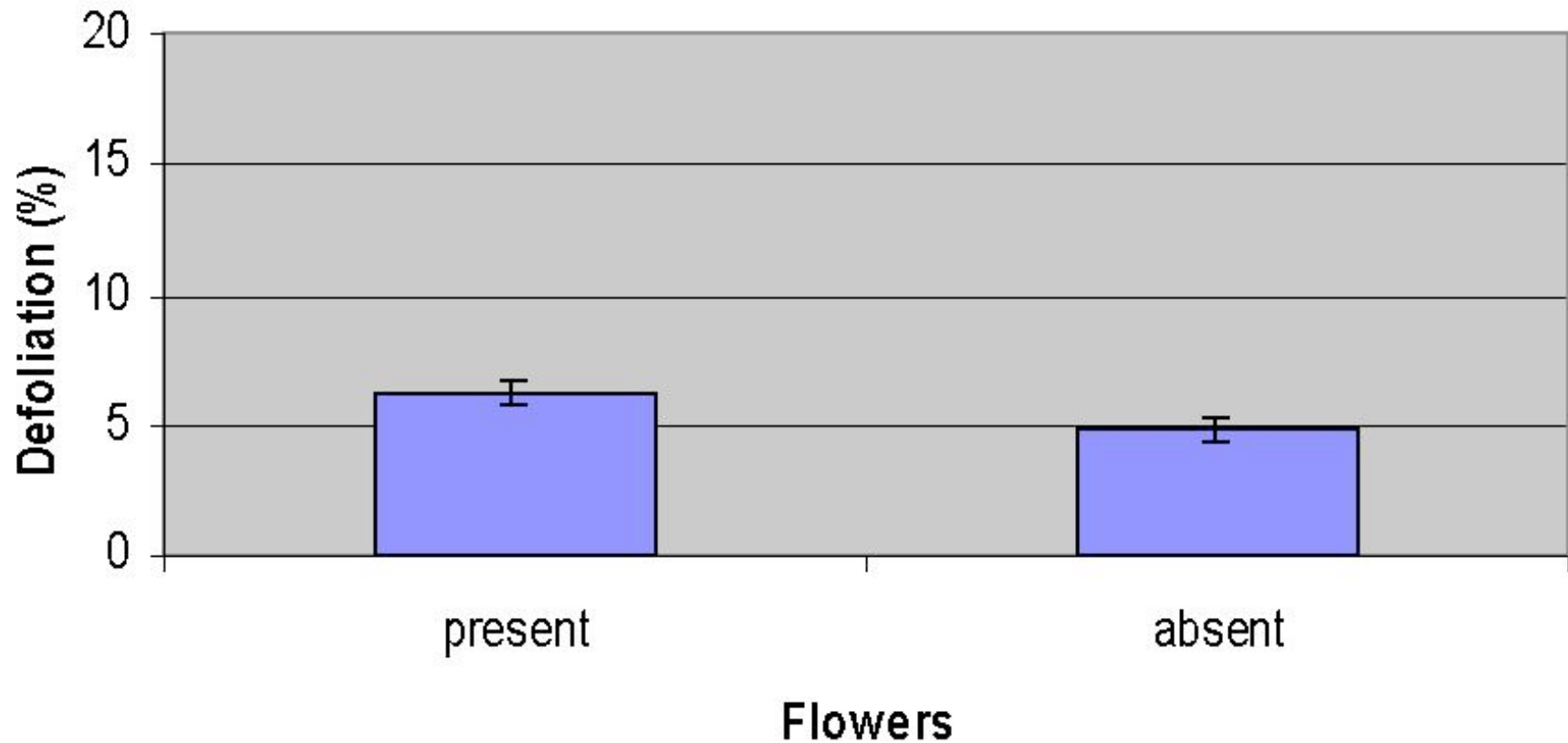
**Maximum Tolerance to JB Defoliation on Canna**



# Canna Defoliation Study

## Presence of Flowers on Plants

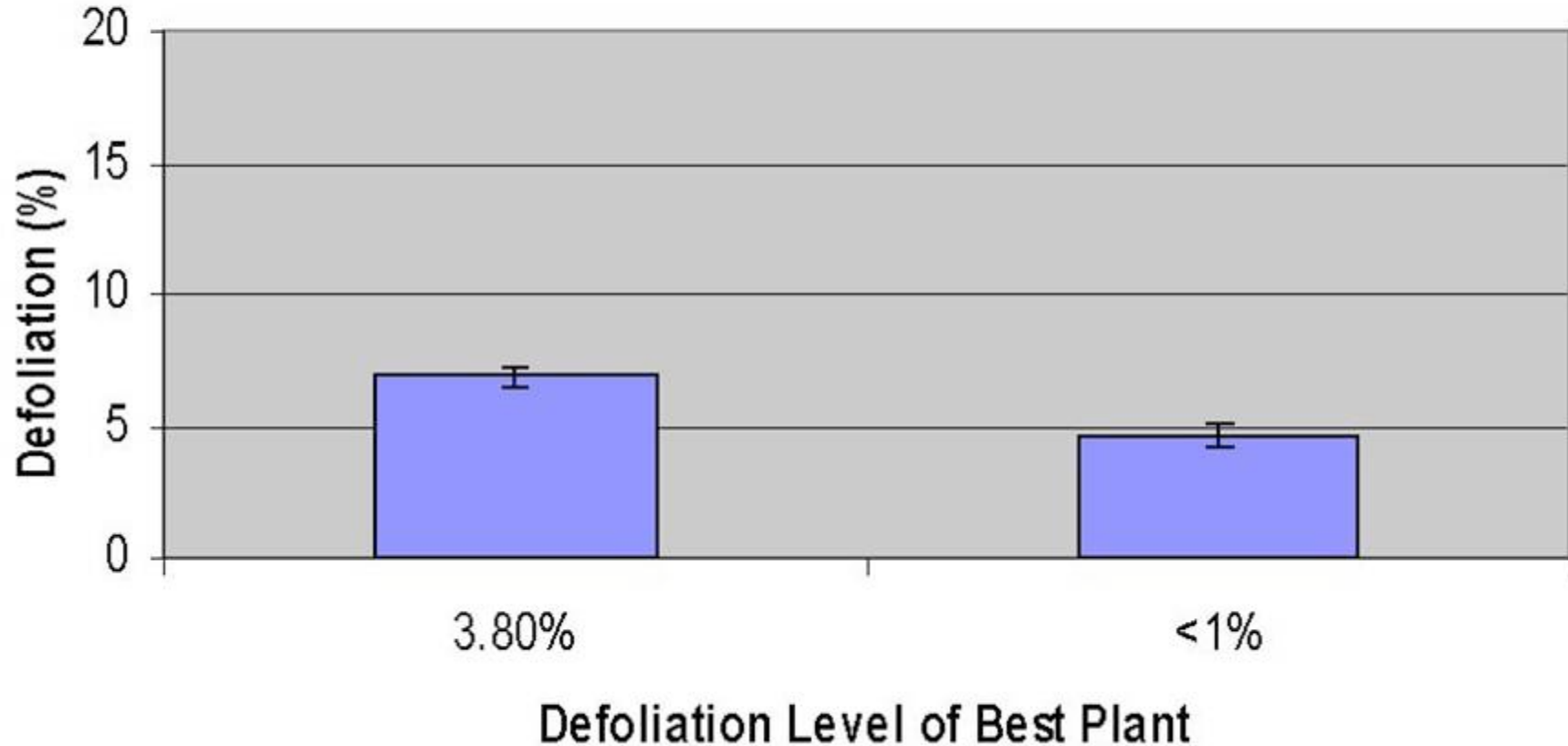
**Maximum Tolerance to JB Defoliation on Canna**



# Canna Defoliation Study

## Quality of Best Available Plant

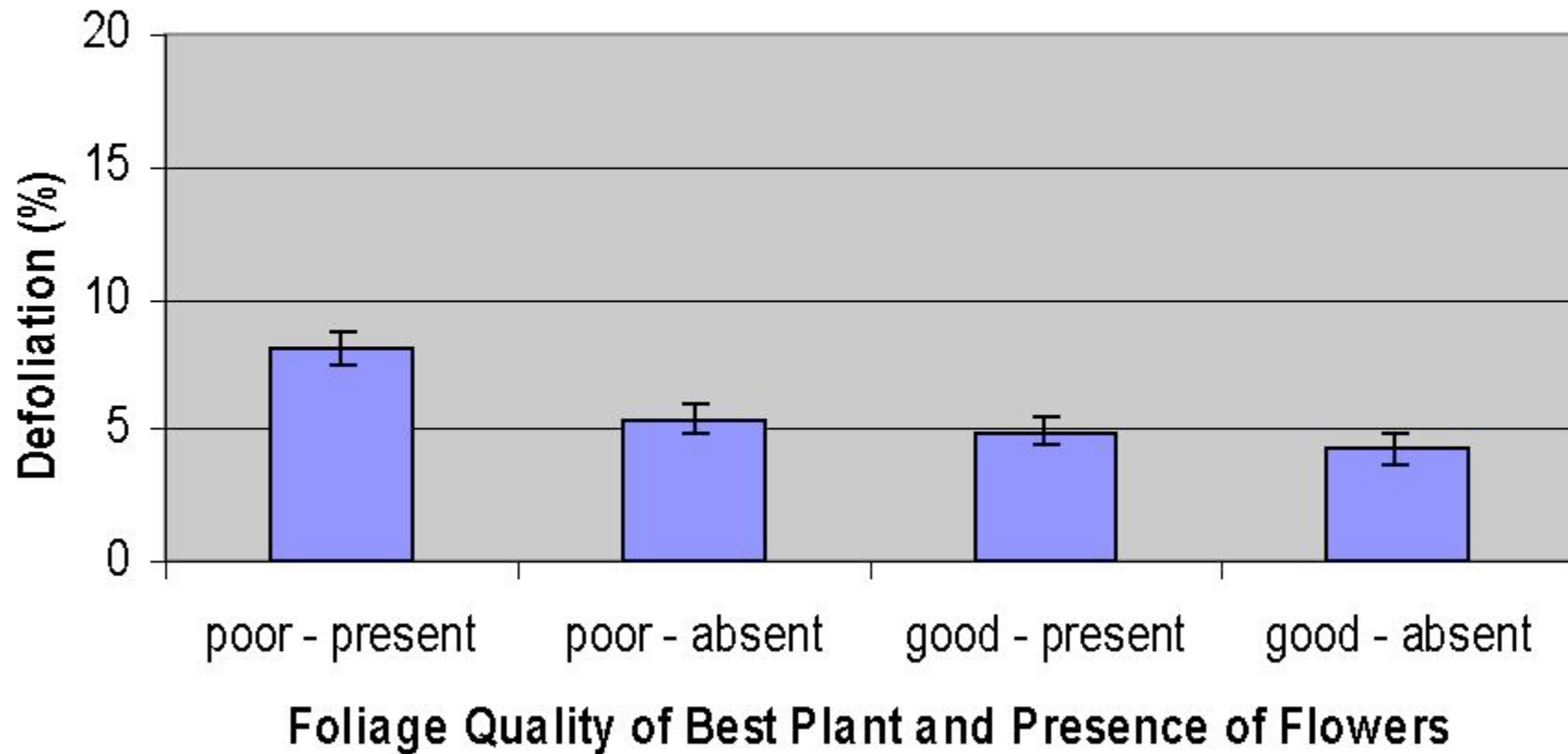
Maximum Tolerance to JB Defoliation on Canna



# Canna Defoliation Study- Interactions

## Best Available Plant \* Flowers

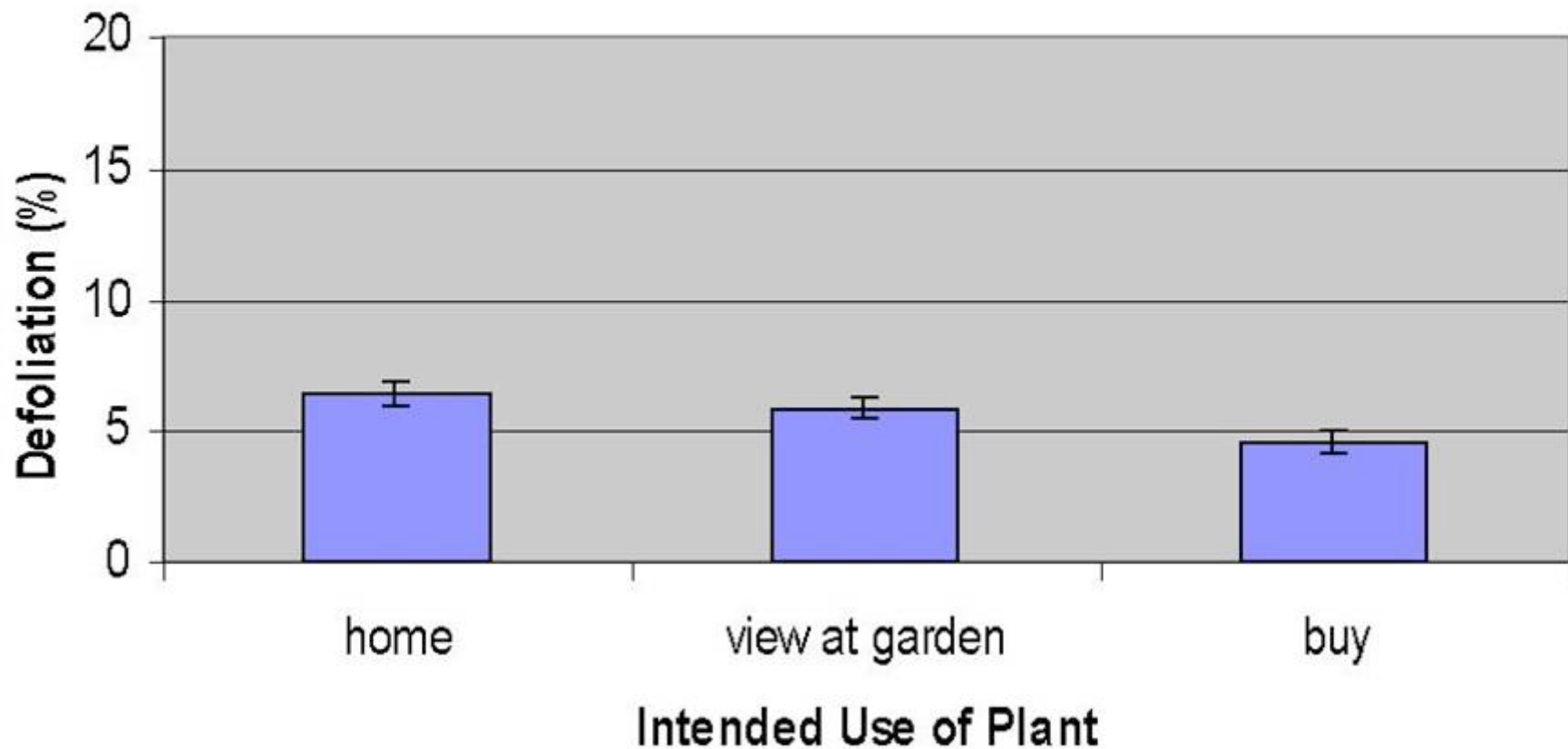
**Maximum Tolerance to JB Defoliation on Canna**



# Canna Defoliation Study

## Effects of Intended Plant Use

Maximum Tolerance to JB Defoliation on Canna



# Canna Defoliation Summary

Tolerance is LOW but it CAN vary

1. Distraction from injury increases tolerance

- Presence of Flowers

2. Visitors may settle for less when it is the only available option

- Best available plant affects choice

3. Plant function

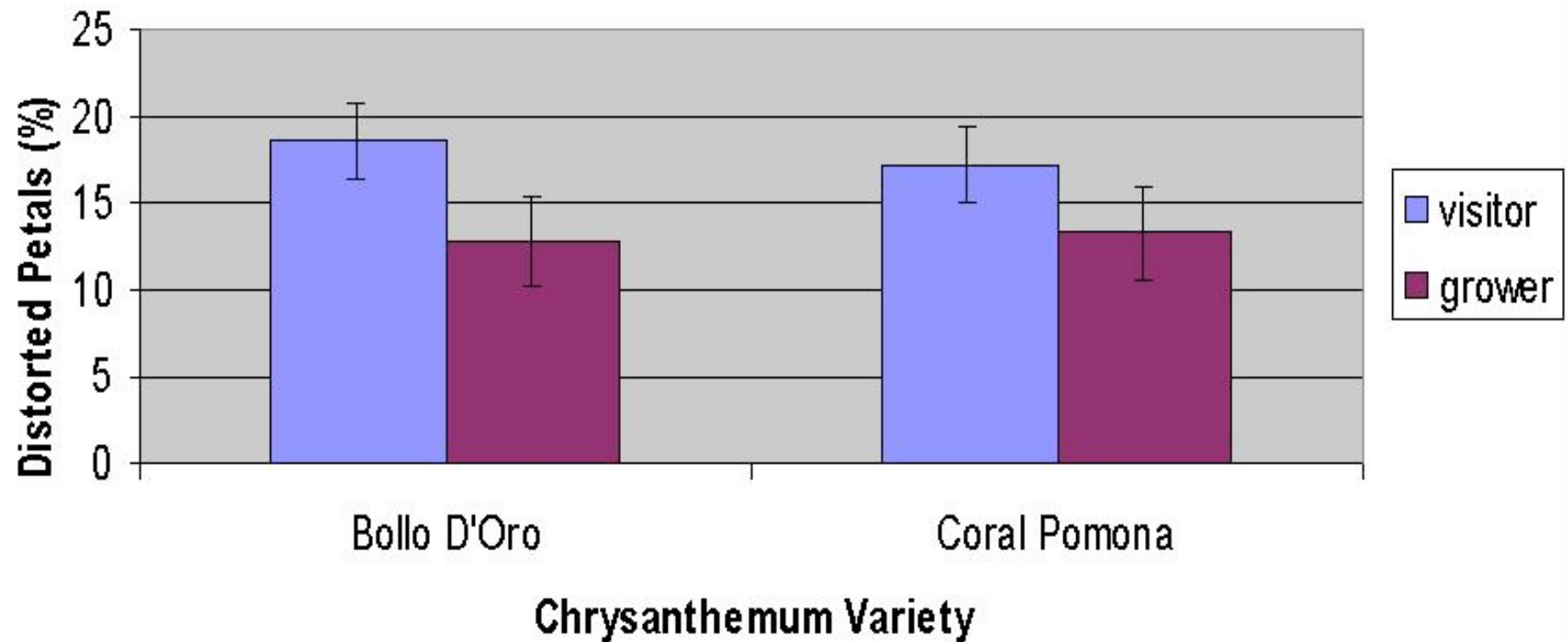
- Lower tolerance for purchasing than viewing





# Visitor vs. Grower Tolerance

Maximum Tolerance of Growers and Visitors to WFT Injury on Flowers





# Chrysanthemum Flower Injury Summary

- Growers more selective than public
- Economic risk a driving factor

# Public Tolerance To Insect Defoliation/Distortion/& Discoloration on Nursery Trees

Summer – Fall 2003

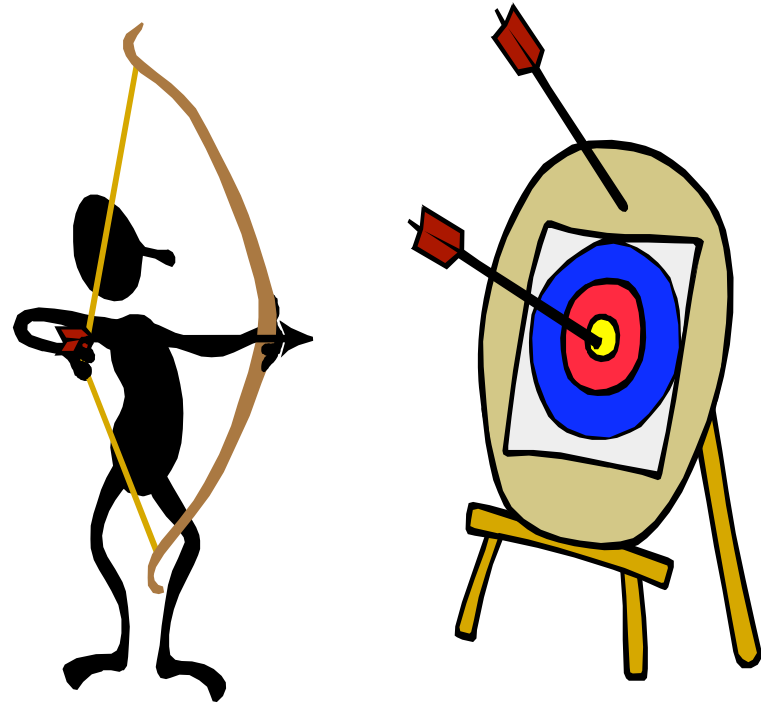
Entomology 692

Kyle Downey



# Target Groups for phone survey

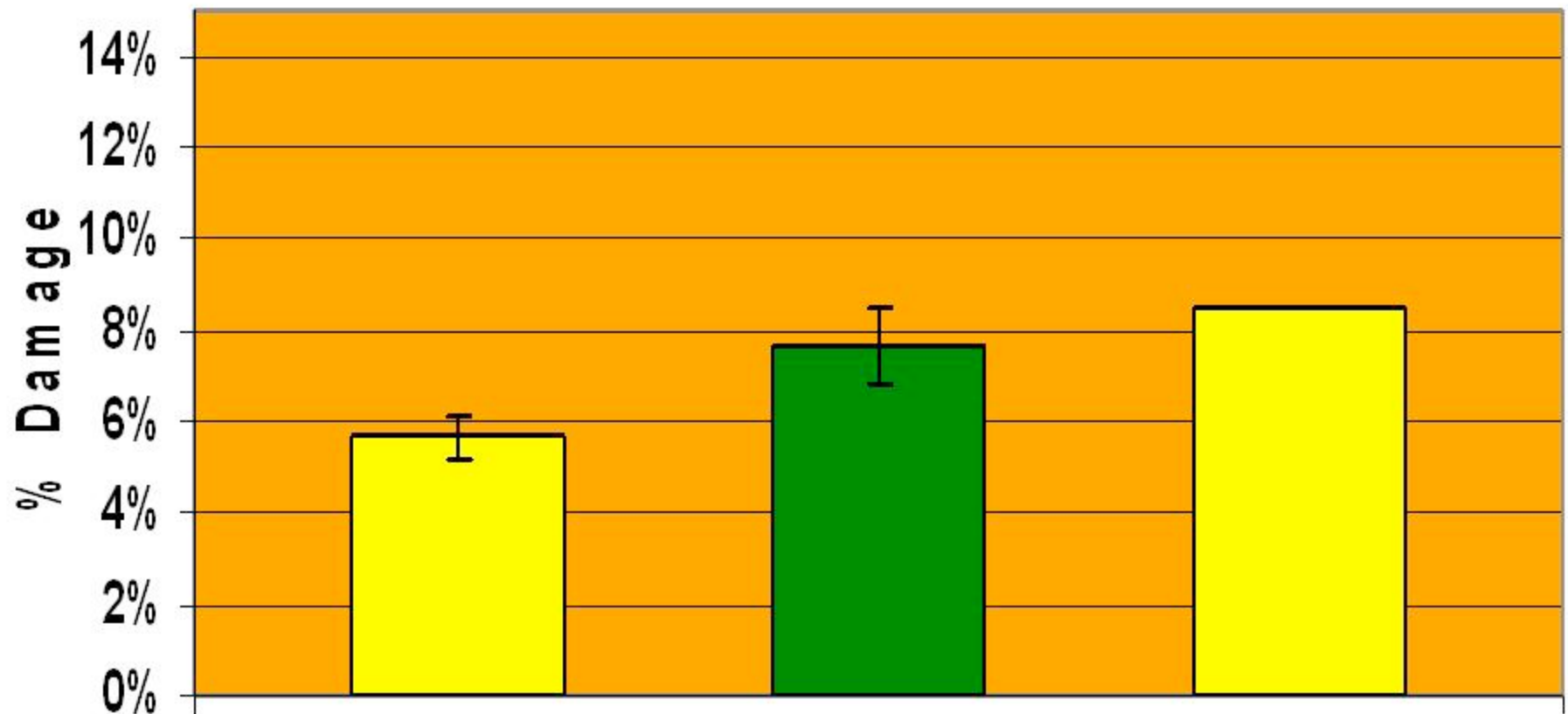
- Wholesale & Re-wholesale nursery owners
  - 15 Total
- Landscape Contractors
  - 15 Total
- Retail Customers
  - 30 Total



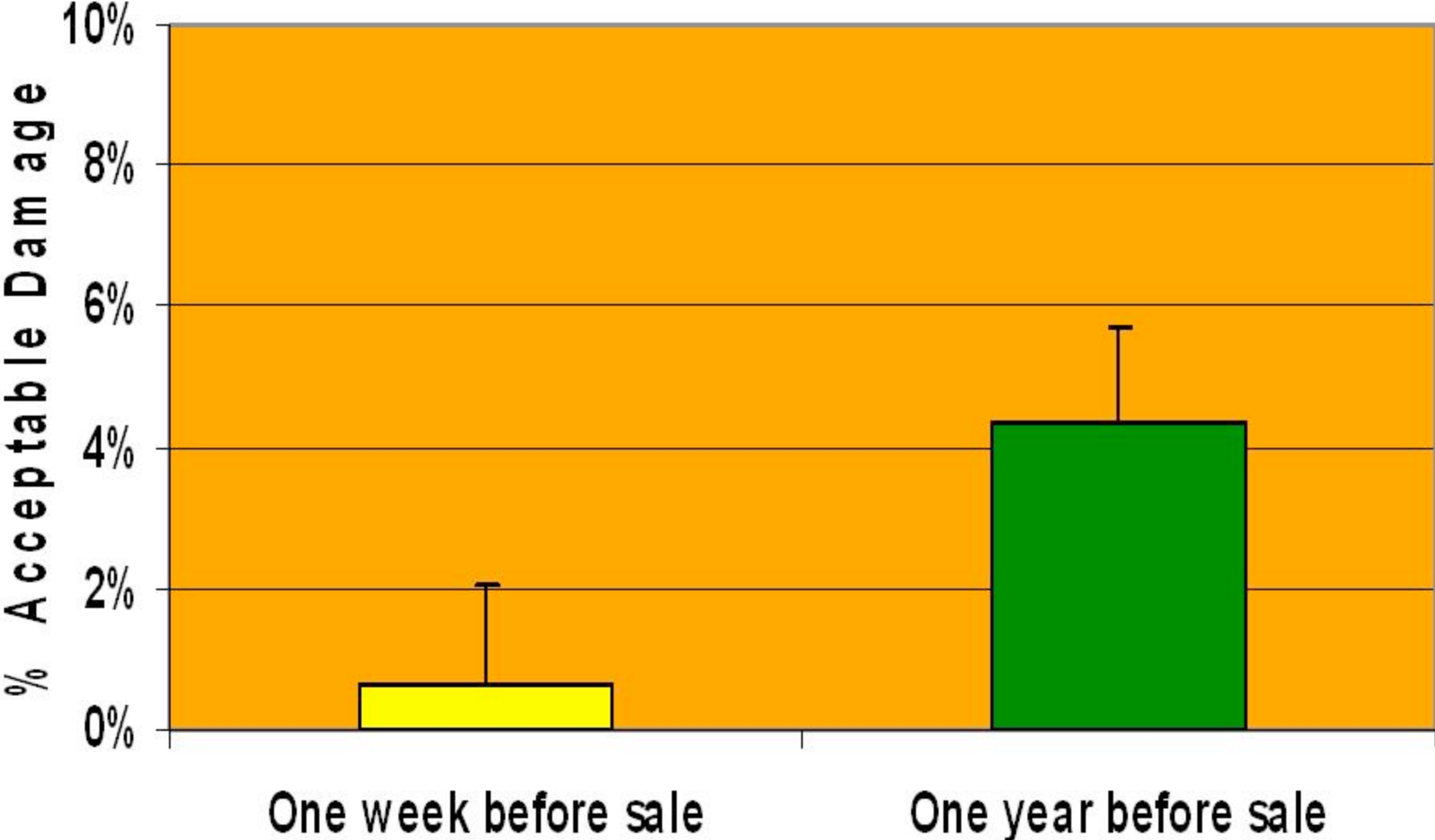
# Findings support economic drivers

- Wholesale tree growers are the least tolerant of insect damage on trees
- Retail customers are the most tolerant of insect damage on trees
- Landscape contractors tolerance to insect damage falls between wholesale growers and retail customers
- Ownership - public has higher insect damage tolerance on publicly owned trees (park trees) than personally owned trees

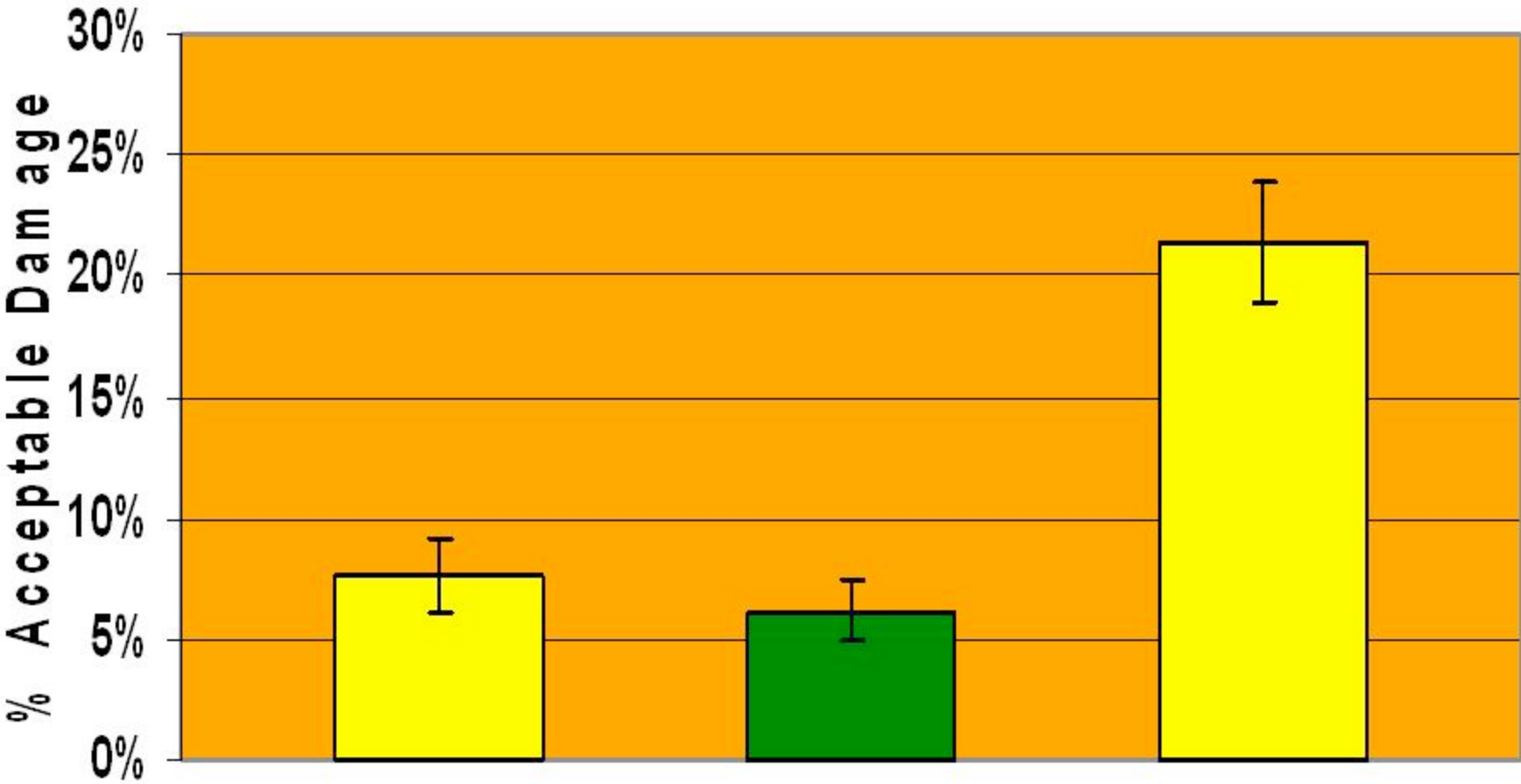
## **% Acceptable Damage - No Discount - All Have Damage**



# Wholesale - Timing



# Retail - Location % Acceptable Damage



# Challenges

- Reliability of sampling methods
- Getting growers to count
- Showing the economic benefit of using thresholds
- Invasive species and quarantine



# Thresholds for exported crops?







# Miami Airport Inspection Center

**To Market or To Ashes?**





# Export Ornamental IPM



<http://www.entm.purdue.edu/Entomology/research/cs/pdf/cleanstock.pdf>